A very remarkable fact is that in a rabbit in which the spinal cord is in a normal condition, and in which the toes, after partial amputation as in the preceding experiments, are about losing the last appearance of sensibility, I find that there is a rapid and very notable return of this vital property if I divide the posterior columns of the spinal cord in the dorsal region. These experiments show that when sensibility seems to be lost in a part deprived of circulation, it is not completely so, but that the transmitted excitation which causes sensation is too slight to produce it, and that if in its way to the sensorium this excitation meets with a cause of increase, then sensation can be produced by it.

II. "On Quaternary Cubics." By the Rev. GEORGE SALMON. Communicated by ARTHUR CAYLEY, Esq. Received June 14, 1860.

(Abstract.)

In this paper quaternary cubics are discussed under the canonical form first given by Professor Sylvester,

$$ax^3+by^3+cz^3+du^3+ev^3,$$

where $x+y+z+u+v=0$.

The writer shows how, when quantics are thus expressed with a supernumerary variable, it is possible to form contravariants also expressed with a supernumerary variable, and such that for the variables, either in covariant or contravariant, we may substitute differentials with regard to the variables of the other. By the help of this principle, covariants, contravariants, and invariants of the cubic are formed with great facility. It is proved that a quaternary cubic has five fundamental invariants of the degrees respectively 8, 16, 24, 32, 40, as well as an invariant of the degree 100, whose square can be expressed in terms of the five fundamental invariants. The discriminant is also expressed in terms of the four first of these invariants. It is remarked that in the same manner as the theory of ternary cubics is analogous to the theory of binary quartics, so there are many analogies between the theory of quaternary cubics and that of binary quintics.

Four covariants are noticed of the first degree in the variables, by the aid of which expressions for the cubic can be obtained analogous

to what M. Hermite has called the "four types" of binary quintics.

Other covariants of the cubic are discussed, and in particular a general expression is given for that covariant of the 9th order which geometrically represents a surface passing through the twenty-seven right lines on the surface of the third order represented by the cubic.

III. "On the Construction of a new Calorimeter for determining the Radiating Powers of Surfaces, and its application to the Surfaces of various Mineral Substances." By W. Hopkins, Esq., M.A., F.R.S., &c. Received June 1, 1860.

(Abstract.)

When the author's Memoir on the Conductivity of various substances was presented to the Society, it was intimated to him on the part of the Council of the Society, that it might be advisable to determine absolute instead of relative conductivities, the latter only having been attempted in his previous experiments. It is partly in consequence of this intimation, and partly from the desire to make his former investigations more complete, that the author has given his attention to the construction of a calorimeter which might serve for this purpose. His present memoir contains a description of this instrument, with the results obtained from its application to the surfaces of various substances.

The apparatus used by Messrs. Dulong and Petit was more delicate and complete than the simpler instrument devised by the author of this paper, but it was calculated only to determine the radiating powers of substances of which the bulb of a thermometer could be constructed, or with which it could be delicately coated. The only substances to which, in fact, it was applied, were glass and silver, the radiation taking place, in the first case, from the naked bulb of the thermometer, and, in the second, from the same bulb coated with silver paper. In these cases, too, it was the whole heat radiating in a given time from the instrument, and not that which radiated from a given area, that was determined. For this latter purpose the apparatus was not well calculated, on account of the difficulty of obtaining with accuracy the area of the surface from which radiation took place. The instrument here described can be easily applied to